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Georgetown Lake

PRE-STUDY



PREPARED FOR THE DEER LODGE-
GRANITE COUNTY COMMISSIONERS
AND CONSERVATION DISTRICT
SUPERVISORS

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Deer Lodge-Granite County Commissioners
Georgetown Lake pre-study (report)

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Deer Lodge - Granite County Area Wide Planning Organization

January 1, 1974

Dear Concerned Citizen:

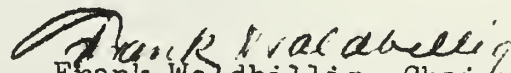
Please find enclosed your copy of the Georgetown Lake Pre-Study report. This report was prepared by the Granite County U.S.D.A. Committee for Rural Development of which David Dickens, Montana Cooperative Extension Service, was pre-study committee chairman. It has been published by the Deer Lodge and Granite County Commissioners.

We hope that this information in conjunction with the information being gathered by Dr. John Wright will enable you to understand the problems and opportunities of the area. A plan of work has been developed for the County Commissioners and detailed reports of various sections are available.

Anyone wishing more information should contact Frank Waldbillig of Philipsburg.

We would like to thank all who assisted with this report.

Yours truly,


Frank Waldbillig, Chairman
Deer Lodge - Granite County
Area Wide Planning
Organization



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INTRODUCTION

The state of the environment is a major concern to people everywhere. As with most problems, man must feel the pressure of a situation before he reacts. In such a case man's reaction is often impulsive and is aimed at the resultant problem rather than its cause.

The local people, realizing the potential for environmental deterioration in the Georgetown Lake drainage area, requested the assistance of the Boards of County Commissioners and Conservation Districts of Deer Lodge and Granite Counties. Their response was to organize a committee which would investigate the situation in depth.

The Georgetown Lake Pre-study Committee has developed as its goal: The collection of factual data and pertinent information which may define and assist in solving existing and potential environmental problems within the Georgetown Lake drainage area.

This report is presented by the committee after one year of investigation. Although some material in this report is of a relatively technical nature, it is not intended to be a technical report as such. Specific and detailed data will be available to the public as technical papers and can be obtained from the Boards of County Commissioners of Granite and Deer Lodge Counties.

Sincere appreciation for the support of this study is conveyed to all the participating private industries, concerned citizens, universities and government agencies whose cooperation and assistance proved invaluable in this project.

This Pre-Study was prepared with the cooperation of many individuals from the Montana University System, Corporations local people, County, State, and Federal Agencies.

The Deer Lodge and Granite County Committees for Rural Development were requested to prepare the report.

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GLOSSARY

Site index - a particular measure of site class based on the height of the dominate trees in a stand at an arbitrarily chosen age.

Sawlog stands - trees of a size, quality and a condition suitable for marketing under given economic conditions even if so selected as not to be immediately accessible for logging.

Site Class - measure of the relative productive capacity of a site for the crop or stand under study. This is based on volume or height or the maximum mean annual increment that is attained or attainable at a given age.

Intrusive bodies - having been forced while in a plastic state into cavities or between layers.

Fescue - a tufted perennial grass with paniced spikelets.

Eutrophication - An aging process for lakes that is caused by an enrichment of nutrients from various sources.

Aerated - to supply or impregnate with air.

Permeability - ability of water to penetrate a surface or soil series.

Surveillance - watch over.

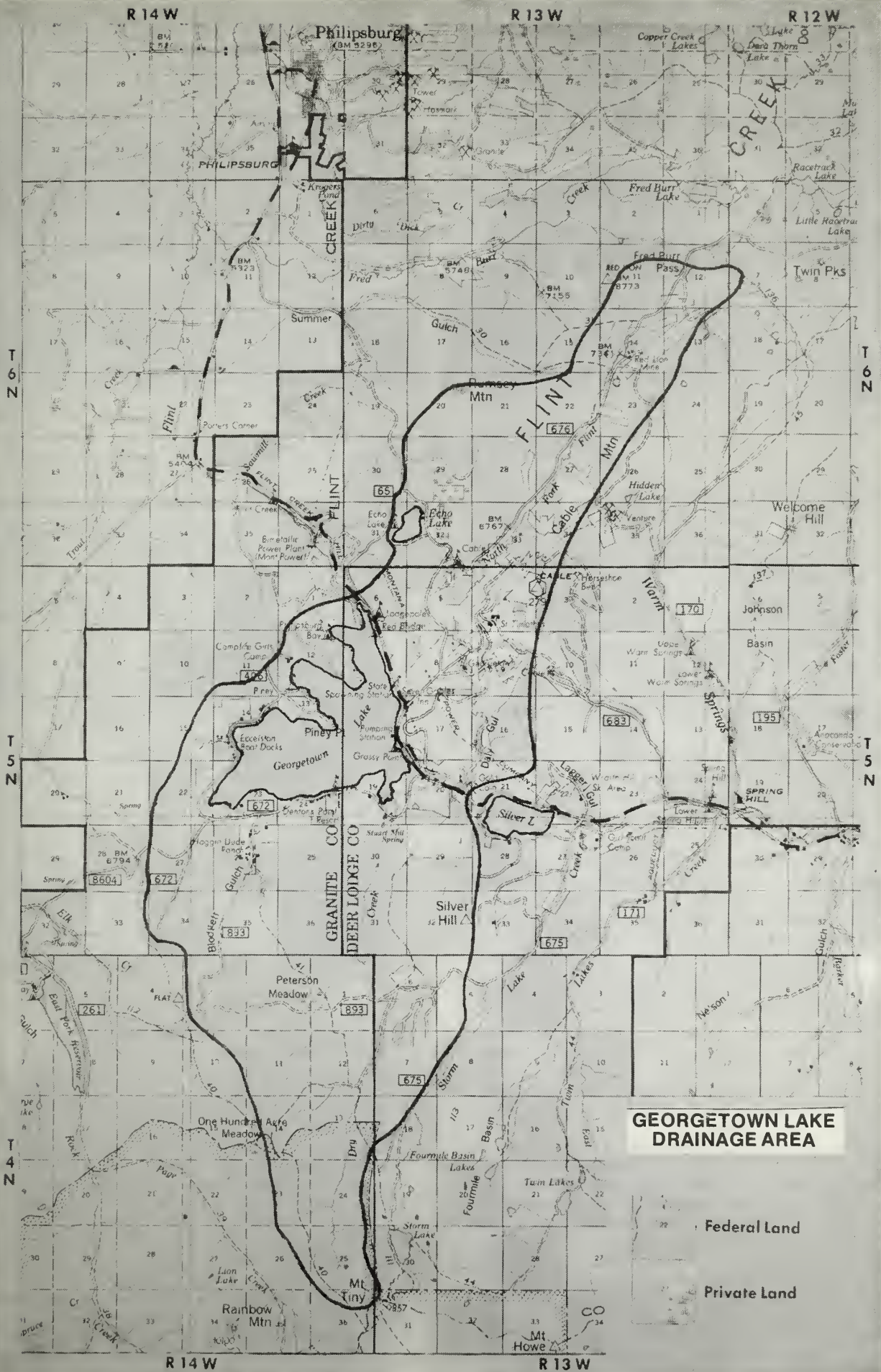
Turbidity - disturbance of sediment causing a darkening, obscuring or confusing of what was or should be clear.

Photosynthesis - formation of carbohydrates in the chlorophyll - containing tissues of plants exposed to light.

Substrate - the base on which an organism lives.

Remedial - concerned with the correction of faulty study habits.

Danthonia - one of the proverty grasses, is an American species.



**GEORGETOWN LAKE
DRAINAGE AREA**

Federal Land

Private Land



Georgetown Lake



Echo Lake

REGIONAL SETTING

The Georgetown Lake Drainage area is located in the Clark Fork River drainage near the divide between Flint Creek and Warm Spring Creek and comprises approximately 32,685 acres. The Flint Creek Mountain Range to the north and the Anaconda Pintlar Range to the south create a scenic setting for the lake. The two major lakes in the Georgetown drainage are Echo Lake with a surface area of 105 acres and Georgetown Lake with a surface area of 2,768 acres.

Georgetown Lake has nearly 19 miles of shoreline, all of which are located in Granite and Deer Lodge Counties. It is situated adjacent to U.

S. Highway 10A and straddles the Deer Lodge-Granite County boundary with approximately one half of the surface area of the lake in each county.

Georgetown Lake is the most heavily fished lake in the state. The climate, scenery and clean fresh air have attracted people to the area for the past 80 years.

Many people have built residences in the area, some being used year around and others seasonally. It has also become a popular recreation area and is easily accessible to over 200,000 people who live within 100 road miles of the lake as well as to tourists who visit the area each year.

HISTORY

The first cattle were grazed on Georgetown Flats about 1872 by John and Bill Shuh. They had homesteaded in the drainage and considered Georgetown Flats their summer cattle range by right of first use. A few other homesteaders settled in the flats area shortly before it was flooded but very little of the land was surveyed or patented.

Mining was an important part of the area development. The Cable, Gold Coin and Southern Cross Mines were all discovered in the immediate vicinity between 1862 and 1868. Gold was taken from the Gold Coin Mine as early as 1863 and as late as 1963. The area produced an estimated eleven and a half million dollars (\$11,500,000) worth of ore before 1920.

In 1885 a small earth dam was built across Flint Creek by the Montana Water Electric and Power Company to produce power for the Bi-Metallic Mining Company operation at Philipsburg and Granite. This dam created the reservoir known as Georgetown Lake.

On January 3, 1902 the Secretary of Interior approved an application filed by Montana Water Electric and Power Company for a Federal Power Commission easement for Georgetown Lake. The Washoe Copper Company which succeeded the Montana Copper Mining Company refiled the easement on January 6, 1910. The Anaconda

Copper Mining Company filed with the Federal Power Commission on October 3, 1910 stating that the Washoe Copper Company had consigned its interest in the permit to them. They also filed an application with the Forest Service on January 27, 1910 for the final water power permit issued to them on July 1, 1911.

The Anaconda Copper Mining Company had an interest in Georgetown Lake prior to 1910. They built a masonry dam in 1901 to an elevation of 6,424.5 feet to meet the water needs at the smelter in Anaconda. In 1919 they raised the dam to its present elevation of 6,429.5. The Company filed an application with the Regional Forest Service for the additional lands flooded by the reservoir. The application was completed and forwarded to the Federal Power Commission on July 15, 1922. License #322 authorizing the additional dam height and lands flooded was issued to the company on January 4, 1926.

The Anaconda Copper Mining Company deeded the entire project to the Montana Power Co. on July 23, 1925. The Federal Power Commission executed the transfer September 16, 1937. The transfer order provided that the terms of the license be amended to expire as of July 1, 1938, and that the Montana Power Company should apply for a major license on or before December 5,

1937. The Montana Power Company filed an application with the Federal Power Commission on December 3, 1937, and a major license #1473 was issued to them for fifty years effective July 1, 1938. On April 25, 1966, the Montana Power Company applied for the Federal Power Commission approval for a two-lane highway across the dam to be constructed by the Forest Service. Approval was issued on May 11, 1967.

The summer climate, scenery, good fishing, and clean air have attracted people to Georgetown Lake for the past 80 years. At one time, Butte-Anaconda and the Pacific Railroad ran special trains on weekends to Georgetown Lake. Chairs were placed in an open gondola car to haul the crowd.

Prior to 1912 the fish in Georgetown Lake were all cutthroat trout native to Flint Creek. The first plant made in 1912 introduced arctic grayling. Various species of fish including whitefish, rainbow trout, steelhead, brook trout, cutthroat trout, chinook and coho (silver salmon) were planted between 1912 and 1937. Considerable drawdown in 1937 resulted in winter kill which greatly reduced the trout population. Prior to this cutthroat weighing four pounds and over were commonly caught. Heavy plantings of cutthroat fry and fingerlings during the next six years were unsuccessful. A program of planting larger trout was successful. Good fishing was again found in the 1940's. The average fish caught weighed from four to five pounds and some rainbow trout and coho up to twelve pounds were caught.

In the early 1950's the size of the fish caught became smaller. Both cutthroat and rainbow trout were planted during the 1950's and early 1960's. Only rainbow trout have been planted since 1962. Each spring approximately 300,000 rainbow trout are planted immediately after the ice goes off the lake. They grow to catchable size by late fall.

Fishing is the major recreational use of Georgetown Lake. It has been described by the State Fish and Game Department as "the most heavily used fishery in Montana." The Department estimates that Georgetown Lake sustains 81,000 fisherman days per year, which is just under 4% of the total fishing pressure for the state. Fishermen caught an average of 1.5 fish per hour during the winter season of 1969 and 1970. Over the past ten years the summer catch rate has varied from 1.4 to 1.8 fish per hour per man which is considered excellent for lake fishing.

TOPOGRAPHY

The Georgetown Lake drainage area at the lowest point is 6,424 feet above sea level. This is the present water level of the lake. There is a gentle sloping area surrounding the lake. As you proceed away from the lake the land becomes steeper and more rocky. Within a few miles the terrain becomes very rugged with peaks ranging in elevation from nine to over ten thousand feet.

GEOLOGY

The geologic history of the Georgetown Lake drainage area is centered on the Georgetown Thrust which is composed of about 200 square

miles in Deer Lodge and Granite Counties. The earliest recorded geologic event in the area was the deposition of sediment which accumulated in a shallow sea. Subsequent periods of deposition and erosion occurred for millions of years.

Compression within the earth caused movement and uplifting along the Georgetown Thrust. Erosion again carved on the area until the outbreak of volcanic activity which formed new basins and filled old ones.

The last major period of development was glacial erosion which reduced the Anaconda-Pintlar Range to a fretted upland. Present day erosion is actively developing the valley flats of the relatively young area.

Abundant supplies of non metallic resources such as limestone, clay and gravel are available in the area. Due to the relative absence of intrusive bodies ore deposits in the Georgetown Thrust area (although of considerable economic importance at one time) are rare when compared to the nearby Philipsburg region.

PRECIPITATION

One of the important aspects of the climate in any area is the amount of precipitation it receives and the form in which it is received—rain or snow. The attached maps show the average inches of annual precipitation, total average inches of snowfall and the weight of snow that can be expected on roofs of structures. This information should prove valuable not only in designing buildings but for recreation, recreation related businesses, mining and other interests in the area.

This information has been obtained from stations measuring total precipitation located at Peterson Meadows, Storm Lake and Fred Burr Pass. In addition, snow survey courses located at Storm Lake, Peterson Meadows, Red Lion, Fred Burr Pass, Intergaard, Southern Cross and Stuart Mill furnish snow data for the drainage basin.

The Montana Power Company, Forest Service and Soil Conservation Service are involved with the collection and interpretation of field data.

VEGETATIVE INVENTORY

Increasing numbers of people are using the land surrounding Georgetown Lake for various purposes, among them: summer home sites, camping and picnicking, hiking, ski areas, horseback riding, trail cycling, hunting, lake access, etc.

These activities have an effect on the vegetation growing in the area. Consequently because of peoples' concern a request was made to the Soil Conservation Service and Forest Service by the Granite and Deer Lodge County

Commissioners and the Granite and Deer Lodge Valley Conservation Districts for a study of the vegetation to assess the impact of increased use on the soils and vegetation in the area. The study consisted of the following: an inventory of the present vegetation and identification of ecological relationships (including the relationships of plant communities to soils) and observations of the response of plant communities to use and management recommendations.



PLANT COMMUNITIES

Vegetation on the area consists of a complex of grassland, shrub and forest associations. Fifteen percent of the area is covered by grasslands found on South and West slopes or sub-irrigated sites adjacent to the lake. The grassland on the dry open hillsides is dominated by rough fescue, Richardson's needle grass and timber danthonia. Range condition on these sites is generally good to excellent except on areas of heavy trampling near the lake. Here, grass composition has shifted to Canada bluegrass and Kentucky bluegrass. These species provide good soil cover and withstand trampling. The sub-irrigated grassland areas near the lake support stands of timothy, tufted hairgrass, baltic rush and red top. Where traffic is heavy these areas shift to bluegrass also. The shrub association consist primarily of willow with some bog birch which occupies areas of very wet soils along streams and lakeshore areas and covers approximately one percent of the area. The forest association occupies 84 percent of the area and is dominated by lodgepole pine.

SOIL-VEGETATION RELATIONSHIPS

Grassland Association

Grassland associations are found primarily on south and west aspects in the area or sub-irrigated areas near the lake. The sub-irrigated areas in the natural state probably were dominated by shrubs which were removed during the period the lake bottom was hayland. Soils supporting natural grasslands on well drained south and west aspects

are of the Hansen, Skaggs and Marcetta soil series. Soil supporting sub-irrigated grasslands is the Marcetta clay subsoil variant.

FOREST ASSOCIATION

Douglas-fir-pinegrass, or Douglas-fir-dwarf vaccinium habitat types are confined to soils with free lime or clayey layers near the surface which occur near the lake or on south and west aspects at low elevations about the lake. These habitat types are not extensive. They are characterized by Douglas-fir or Lodgepole pine in the overstory and Douglas-fir reproducing in the understory in association with pine grass, elk sedge, strawberry, dwarf vaccinium, snowberry and kinnikinnick. At the present time much of this habitat type is dominated by a lodgepole pine overstory. Soils commonly supporting these habitat types are:

Whitore—The Whitore gravelly loam soils are on steep mountains with slopes of 15-30%.

Crylic Crow (west slopes)—The Crow gravelly loam, cold soils are on benches with slopes of 2-5%.

Upsata—The Upsata gravelly loam soils are on gently sloping outwash terraces with slopes of 2-4%.

The Alpine Fir types are characterized by sites that are cooler and more moist than the Douglas-Fir types. These types are found on the north and east slopes at the lower elevations, and on all aspects at the higher elevations.

The Alpine Fir habitat types generally have an overstory vegetation of lodgepole pine, alpine fir, or engelmann spruce. The understory vegetation consists of various combinations of grouse whortleberry, beargrass, false huckleberry, woodrush, prince's pine, pinegrass, and elk sedge. The soils supporting the alpine fir habitat type are:

Wessel—The Wessel gravelly loam soils are on steep mountains with slopes of 15-35% formed in limestone.

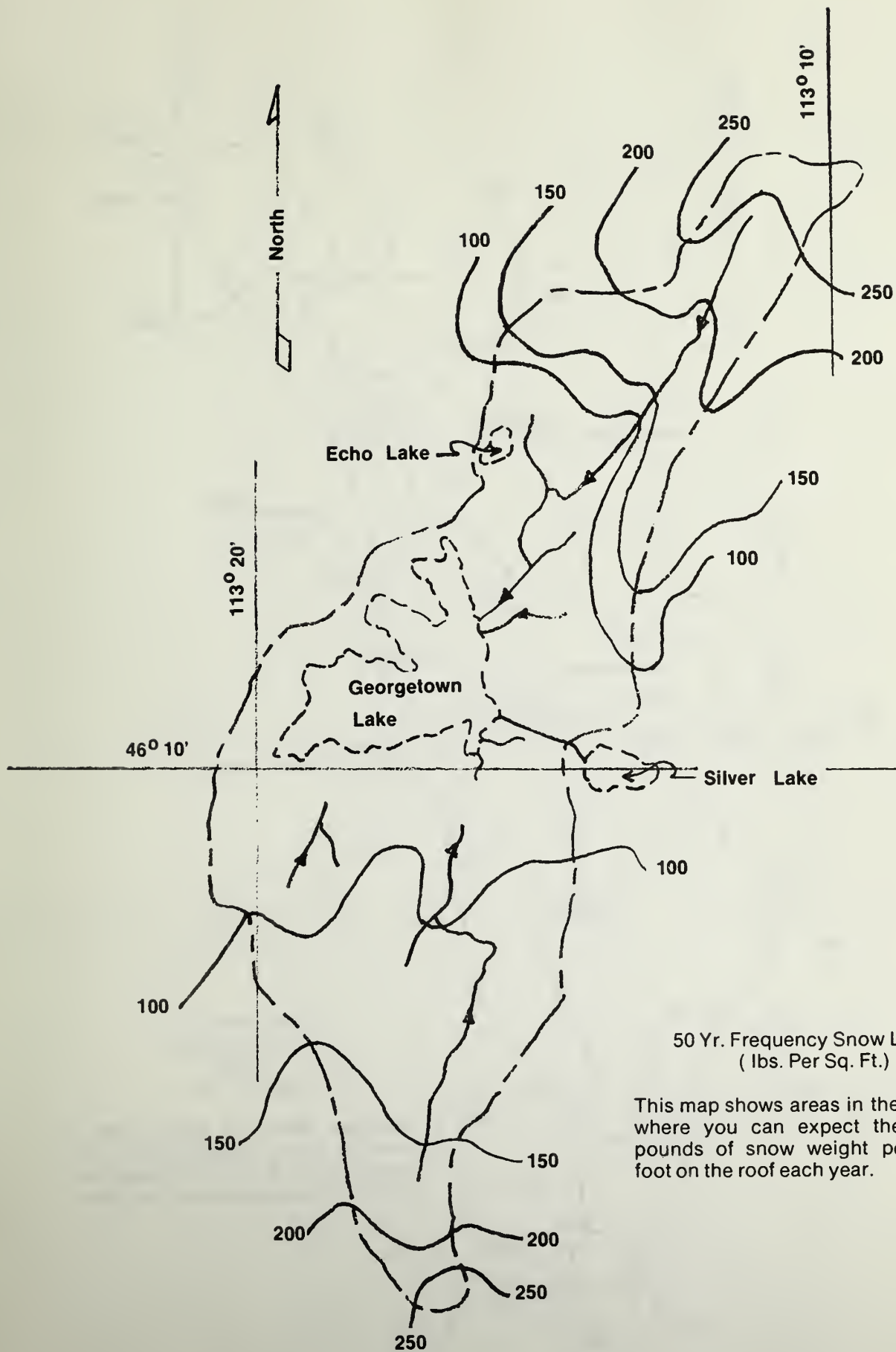
Garlet—The Garlet gravelly loam soils are on steep mountain areas with slopes of 15-35%.

Crylic Crow—The Crow gravelly loam, cold soils are on benches with slopes of 2-5%. Unnamed granitic soil at elevations above 6500'.

RESPONSE OF PLANT COMMUNITIES TO RECREATION USE

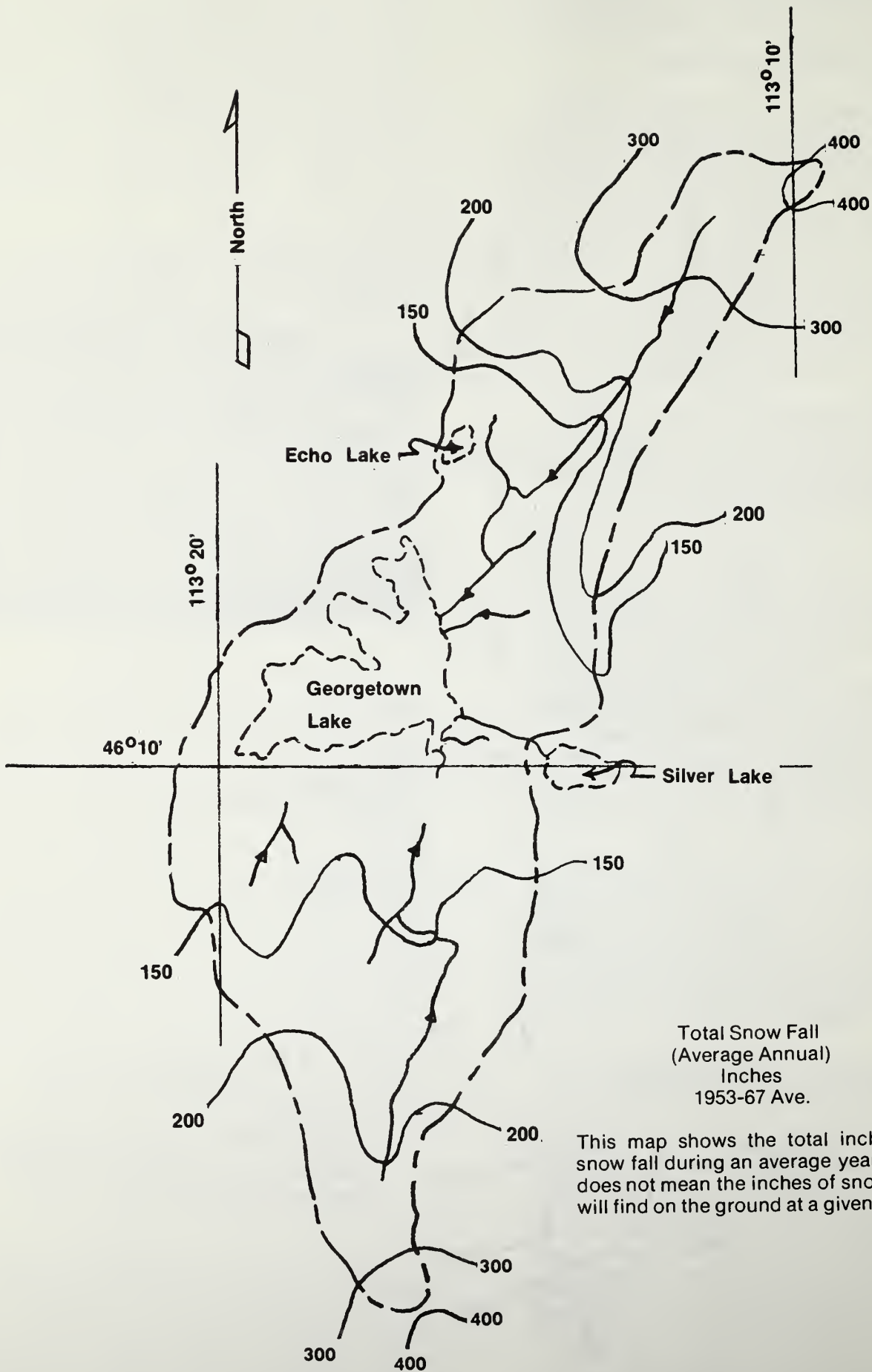
Clearly the grassland plant communities withstand recreational use trampling the best. Yet, under heavy use even the protective grass cover can be eliminated, exposing the bare soil to erosive forces and Georgetown lake to possible pollution from sediment and nutrients. Hazards of erosion are greatest on steep slopes and on soils with slow permeability. It was observed during the study period that a few scars were beginning to show on the hillsides in the grasslands from vehicle use.

The forest understory plant communities are very sensitive to trampling. Unlike the grassland, there are few grasses that will replace the climax



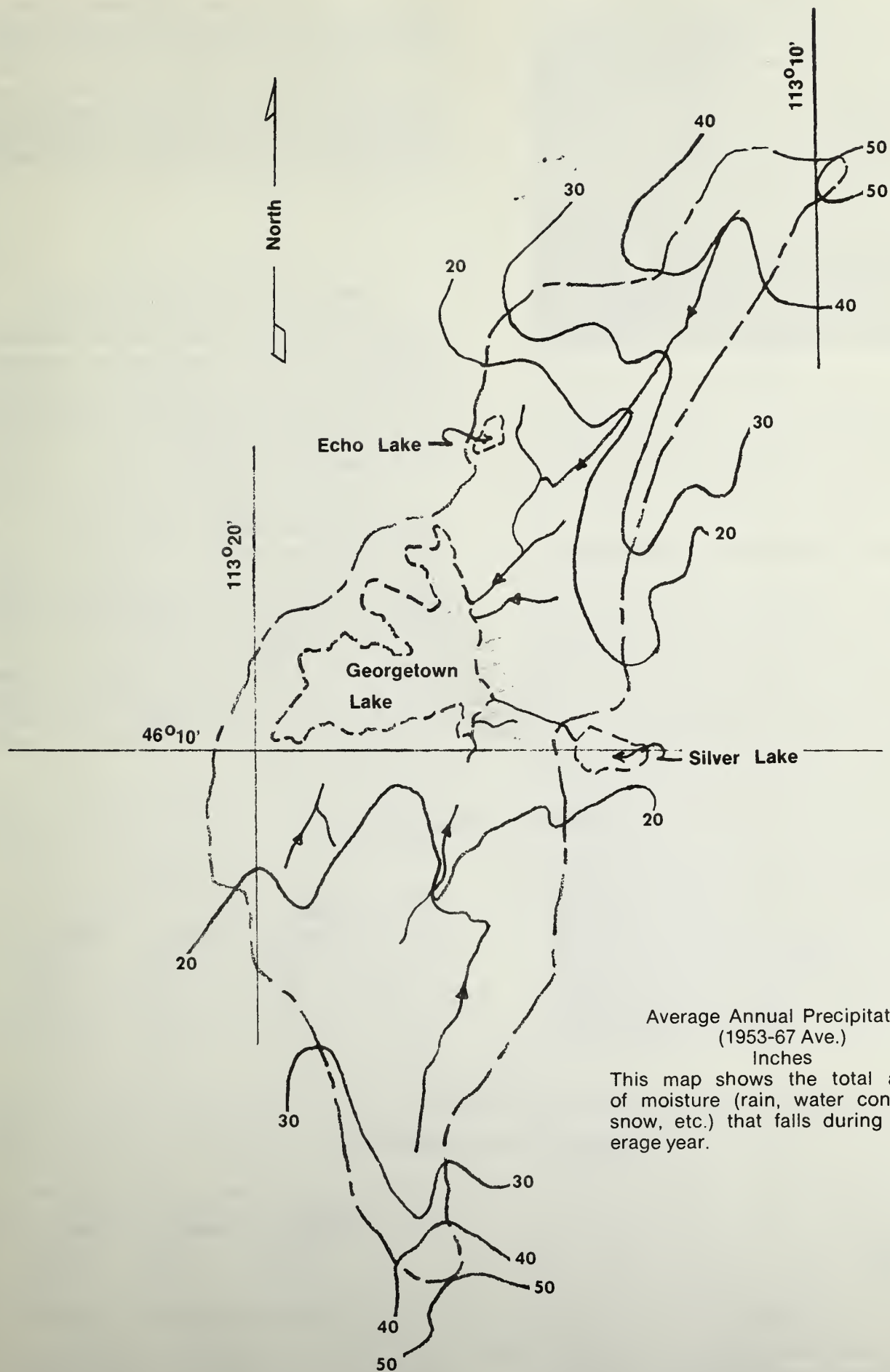
50 Yr. Frequency Snow Loads
(lbs. Per Sq. Ft.)

This map shows areas in the drainage where you can expect the average pounds of snow weight per square foot on the roof each year.



Total Snow Fall
(Average Annual)
Inches
1953-67 Ave.

This map shows the total inches of snow fall during an average year. This does not mean the inches of snow you will find on the ground at a given time.



Average Annual Precipitation
(1953-67 Ave.)
Inches

This map shows the total amount
of moisture (rain, water content in
snow, etc.) that falls during an av-
erage year.



understory plants. As a result, even under relatively light use, vegetative cover is lost and soil exposed. There are differences in resistance to trampling within the forest association. These differences, in conjunction with management, can improve the ability of the forest communities to meet use pressures.

Soil Productivity and Woodland Management Interpretations

Site index measurements were taken for lodgepole pine on the various timbered soils in the area. Site index values range from 63 on Upsata soils to 75 on Whitore soils. Too few plots were taken to establish significant differences between soil series. Assumption of a mean site index of 70 for the area would not be unreasonable.

Assuming a mean site index of 70 to 100 years

of age, timber stands of lodgepole pine can be expected to yield 13,000 to 16,000 bd. ft. or 5,000 to 6,000 merchantable cubic feet of timber per acre, depending upon the level of management.

In woodland management, as in grassland management, maintenance of good vegetative soil cover is the best watershed protection possible. It is imperative soil cover be maintained to keep soil pollutants out of Georgetown Lake.

TIMBER INVENTORY AND HARVEST

The Georgetown Lake basin consists of approximately 32,685 acres including 2,889 acres of water.

The 29,796 acres of land within the drainage basin consists of 25,036.5 acres of forest land, 4,692 acres of non-forest land, and 67.5 acres of non-commercial forest land.

Forested lands are those areas suitable for management and capable of producing in excess of 20 cubic feet (approximately 120 bd. ft.) of timber per acre per year.

Non-forested lands are those that have never supported forest growth, or land from which the forest growth has been permanently removed to less than 10% stocking.

Non-commercial forest lands are those incapable of yielding usable wood products because of adverse site conditions or so physically inaccessible as to appear economically unfeasible now or in the future.

PRESENTLY COMMERCIAL*

	Acres		
	Forest Service	Private	Total
Lodgepole pine	4,965.0	560.0	5,525.0
Douglas-fir	362.5	-----	362.5
Spruce/Alpine fir	535.0	132.5	667.5
	-----	-----	-----
Total Acres	5,862.5	692.5	6,555.0

*Commercial - lands having commercial sawlog stands 11 inches dbh (diameter, 4½ feet above the ground) and larger.

PRESENTLY PRECOMMERCIAL**

	Forest Service	Private	Total
Lodgepole pine	13,944.0	4,125.0	18,069.0
Douglas fir	382.5	30.0	412.5
Other	-----	-----	-----
Total Acres	14,326.5	4,155.0	18,481.5

**Precommercial-Stands of less than nine inches dbh. Includes seedlings, saplings and poles.

Since 1946 1,657 acres have been harvested in the drainage from the public lands. Approximately 10,885 thousand board feet of timber were removed.

There has also been cutting on the patented mining claims along the North Fork of Flint Creek. This cutting took place in the period 1960-1972. Acres cut are estimated at 200 and the volume removed approximately 1,5 million board feet.

FISH AND WILDLIFE

Georgetown Lake is recognized as the most heavily fished lake in Montana and has been the subject of intensive surveillance on fisherman-use and game fish harvest since 1958. Summer use on Georgetown Lake has been approximately 3 to 4 times greater than winter use. Summer use has ranged from 24,654 fisherman days in 1958 to 45,617 in 1970, while winter use has ranged between 10,000 and 17,000 fisherman days.

Rainbow trout has been the dominate species in the harvest since 1961. Annual plants of sub-catchable rainbow are made into Georgetown Lake. Kokanee salmon, which spawn along the shore in the lake and Stuart Mill Creek, have increased considerably in the catch in the last three years. Current management direction is to attempt to have a 14-inch average size trout available to the angler.

Non-resident fisherman use is greatest in the summer months. During the summer of 1970, 19 percent of the total fishermen checked were non-residents. Less than one percent of the fishermen in the winter fishery have been non-residents.

Studies have shown that Georgetown Lake has the potential to winterkill. Low oxygen concentrations have been found during several winters with no detectable dissolved oxygen found at several stations. Increased eutrophication of Georgetown Lake can only increase the winter kill potential and create a habitat unfavorable for trout and salmon.

Georgetown Lake was mechanically aerated two years in a row in an effort to evaluate the effects of aeration on water temperatures and dissolved oxygen concentration during winter and early spring.

Results of this study were not as successful as had been expected so the study was discontinued.

WILDLIFE

Fish and game observations indicate that there is virtually no deer winter range in the drainage. Elk

winter range is limited to the low hills east and north of Hiway 10A between Georgetown Lake and Silver Lake, and perhaps some early winter range on the grassy parks lying near the divide between Blodgett Gulch and Elk Creek.

There is a winter population of 25 to 50 elk and a few moose which winter in the area. Portions of three hunting districts lie in the Georgetown Lake drainage and it is estimated that 30 to 50 deer, 20 elk and 2 to 3 moose are harvested annually. The impact of big game and hunter use on the area is insignificant compared to other uses.

WATER QUALITY

The principle water quality problems encountered in lakes come from the processes of contaminations, sedimentation and accelerated eutrophication. It appears this is also true of Georgetown Lake. Contamination and sedimentation can originate both within the lake and from the surrounding area. They can be either organic: decaying aquatic plants, animal wastes, wood etc., or inorganic: elements and minerals like limestone which are located in the area. Erosion along the shoreline, as well as poor agricultural and construction practices, can accelerate these processes.

The sources of nutrients entering a lake can be either from a specific location, which generally can



be identified, or from a diffused source which is more difficult to pinpoint and to treat. The release of nutrients from the lake bottom is a natural recycling process. However, this process can be increased when the bottom is disturbed. Even rainfall adds air-borne nutrients to the lake.

The Old adage, "An ounce of prevention is worth a pound of cure," is by far the best approach to managing a lake and the surrounding area. Where problems already exist certain practices can be initiated that will either forstall further degradation or begin to repair damages.

There are two general approaches to controlling lake eutrophication, lake renewal and management: 1. Limiting fertility. 2. Treating the results of over fertilization.

A definite approach to limiting lake fertility is

TABLE Summary of Georgetown Lake Creel Census Data - Winter Censuses

Year of Study	Estimated No. of Fishermen Days	Estimated Hours Fished	Estimated No. of Game Fish Harvested	Estimated Weight of Catch (Lbs.)	Percent of Harvest By Species 1/				Catch Per Hour	Ave. Wt. (Lbs.) of Predom. Species 1/
					Rb	Ct	Eb	Gr		
1958-1959 Sat., Sun Legal Holidays	17,974	83,369	70,252	42,125	5.0	89.6	5.4		0.84	0.59 (Ct)
1960-1961 Sat., Sund., Legal Holidays	15,605	68,900	49,175	No. Est.	36.7	43.3	3.3	0.2	16.5	0.63 (Ct) 0.85 (Rb)
1962-1963	11,774	46,432	34,969	No. Est.	71.8	15.5	6.1		Tr.	0.750.77 (Rb)
1963-1964	10,041	41,206	22,560	20,839	80.9	6.2	6.9		8.7	1.01 (Rb)
1966-1967	12,329	42,420	58,675	No Est.	89.4	0.1	3.6	0	7.0	.68 (Rb)
1967-1968 (Partial)	No Est.	No. Est.	No. Est.	No. Est.	87.4	0.1	2.1	1.5	8.9	.68 (Rb)
1969-1970	14,642	56,399	80,252	40,944	82.8	0.1	1.8	0.9	14.4	.52 (Rb)
1970-1971 (Partial)	No. Est.	No. Est.	No. Est.	No. Est.						
1971-1972	10,169	33,114	54,954	No Est.	59.1	Tr.	4.2	0.2	36.5	.68 (Rb)

1/ Abbreviations: Rb-rainbow; Ct-cutthroat; Eb-brook trout; Gr-grayling; Salmon-kokanee and/or coho.

TABLE Summary of Georgetown Lake Creel Census Data - Summer Censuses

Year of Study	Estimated Number of Fishermen Days	Estimated Hours Fished	Estimated Numbers of Game Fish Harvested	Estimated Weight of Catch (Lbs.)	Percent of Harvest By Species 1/				Catch Per Hour	Ave. Wt. (Lbs.) of Predom. Species 1/
					Rb	Ct	Eb	Gr		
1958	24,654	94,824	40,401	40,249	2.9	88.0	5.7	3.4	0.43	0.80 (Ct)
1961	30,390	108,916	50,353	No Est.	60.5	34.3	3.7	0.7	0.8	0.4 — (Rb)
1962	44,500	174,500	83,000	No. Est.	69.9	24.0	4.7	0.1	1.3	0.48 — (Rb)
1967 (3 Days in July)	129	519	406	No Est.	90.4	1.2	3.9	0	4.4	.78 —
1970	45,617	152,325	126,109	79,496	84.7	0.1	3.2	0.6	11.3	.83 —

1/ Abbreviations: Rb-rainbow; Ct-cutthroat; Eb-brook trout; Gr-grayling; Salmon-kokanee and/or coho.

to restrain nutrient input and reduce nutrient recycling. Restraint can be accomplished by diverting or eliminating sources of nutrients. The reduction of nutrient recycling can prove costly, however, certain practices such as flushing can be effective and could help control the process.

Treating the results of over fertilization can also prove costly and time consuming. Very often these measures give only short term results and have to be repeated. More permanent measures such as dredging and lake flushing could give better results but pose new problems such as how to dispose of the removed material, etc.

Some large companies and municipal plants have used alum and aluminum salt in lakes to remove phosphate. Short term results of these projects have been encouraging, with a reduction of nutrients in the lake, less algae growth and improved dissolved oxygen concentration. It should be emphasized that this particular method is still in the experimental state.

Improved waste treatment reduces nutrients from sewage and other waste water before they are discharged into the lake. Technology exists, for example, for taking almost all of the nitrogen and phosphate out of the water. Waste treatment costs rise, however, when total, as opposed to partial removal of nutrients, is undertaken.

Water quality studies have been made on Georgetown Lake to determine quantities of nitrates, phosphates, dissolved oxygen, specific conductivity, pH, turbidity and bacteria. The results of these tests are not complete and more tests will be conducted during the coming year.

TRAFFIC SURVEY

To better determine the use of the Georgetown Lake area traffic studies were made.

The accompanying map entitled **road count**, shows traffic counter locations for the Georgetown Lake Area. Counters were installed on Road #406, 50 feet west of the spillway bridge on the dam, and on Road #672, approximately two-tenths of a mile east of Sturat Mill Creek. Count was collected on these roads during the summer months of 1970 and 1971.

1970—The weekend traffic pattern of East Fork Road #672 for the period of June 1, 1970, thru October 21, 1970, had a low daily (24 hour) volume of 153 and a high daily volume of 1103. Four days of this period recorded traffic above 1000 vehicles per day. The pattern during the week shows a significant drop in traffic on Monday, somewhere between 25% and 33% of the Sunday's volume. The volume then remains fairly constant through Thursday with an increase of around 20% to 25% for Fridays. The average daily traffic from May 28, 1970, to October 21, 1970, was 418. The total traffic count over East Fork Road #672 for this period was 50,549.

The traffic pattern for Georgetown Lake Road #406 shows a very similar pattern, with higher count. This higher count may be due to the fact that the Georgetown Lake Road offers easier access to more recreational facilities to the Northwest portion of the lake than does the East Fork Road on the south side of the lake.

1970—The traffic pattern for the Georgetown Lake Road shows traffic volume for the period May 28, 1970, thru September 14, 1970, for the weekend traffic to have a low daily (24 hour) volume of 138 and a high daily volume of 2003. Fourteen days of this period recorded traffic above 1000 vehicles per day. The pattern during the week is very similar to the count for East Fork Road. The count on Mondays is only 25% to 33% of the Sunday's count. This value is basically retained for the rest of the week except for Fridays, when an increase of 15% to 20% is recorded over Thursday's values. The average daily traffic from May 28, 1970, to September 14, 1970, was 647. The total traffic count over Georgetown Lake Road for the period was 67,904.

1971—The weekend traffic pattern of East Fork Road #672 for the period of June 10, 1971, thru November 23, 1971, has a low daily (24 hour) volume of 192 and a high daily volume of 1749. Eighteen days of this period recorded traffic above 1000 vehicles per day. The average daily traffic from June 10, 1971, through November 23, 1971, was 553. The total traffic count over East Fork Road #672 for this period was 81,820.

By comparing the same time periods, June 10 through October 21, for both 1970 and 1971 traffic count on East Fork Road, we arrive at 416 vehicles per day for 1970 and 653 vehicles per day for 1971. This is an increase of 57%

1971—The weekend traffic pattern for the Georgetown Lake Road #406 shows traffic volume for the period June 10, 1971, through October 14, 1971 has a low daily (24 hour) volume of 114 and a high daily volume of 2093. Eighteen days of this period recorded traffic above 1000 vehicles per day. The average daily traffic from June 10, 1971, through October 14, 1971, was 605. The total traffic count over Georgetown Lake Road #406 for this period was 74,441.

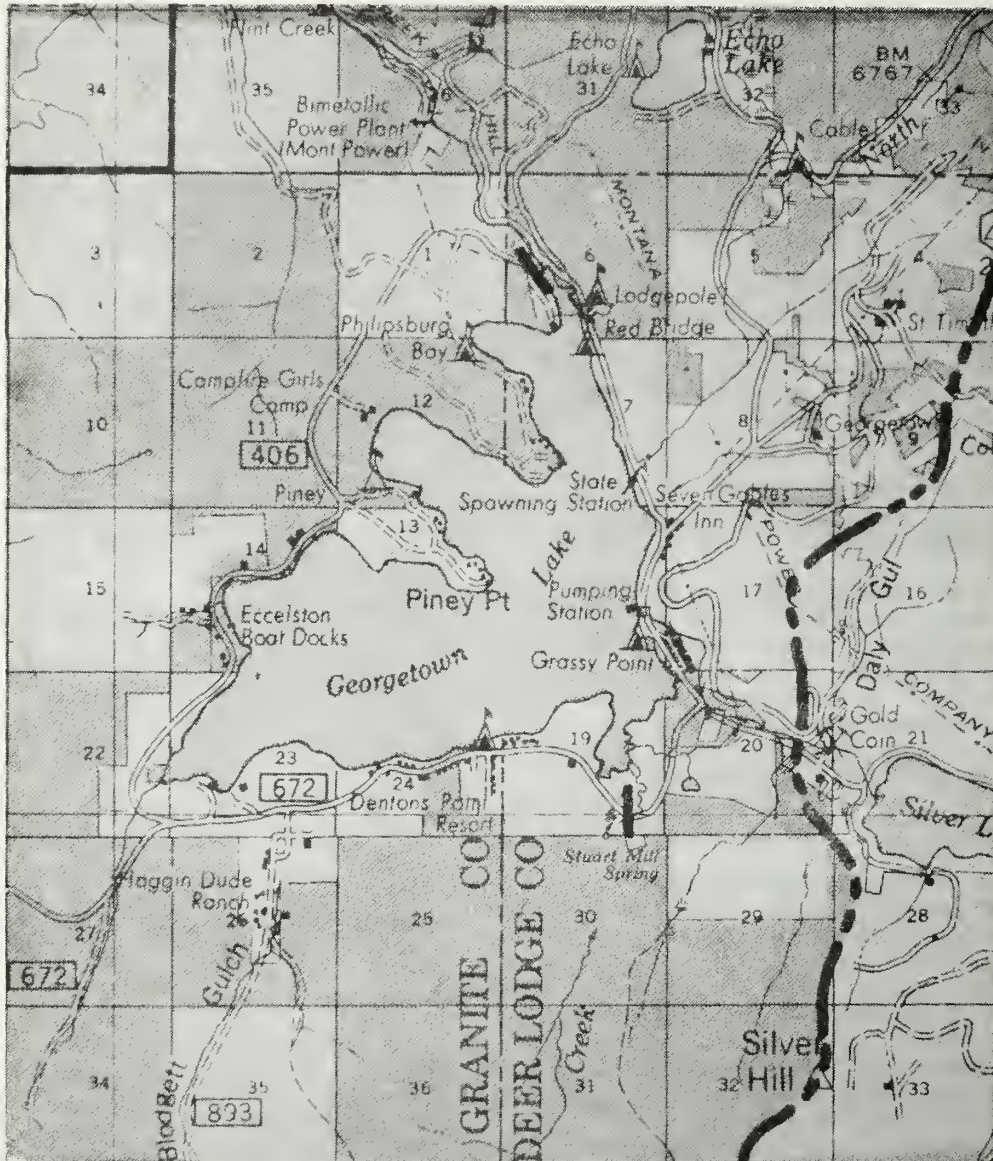
By comparing the traffic count on Georgetown Lake Road #406 for the same time periods, June 10 through September 14 for both 1970 and 1971, we arrive at 686 vehicles per day for 1970 and 759 vehicles per day for 1971. This is an increase of 11%.

An origin and destination survey was made Thursday, August 24, 1972, on Georgetown Lake Road #406. There was a total of 100 vehicles in a five hour count from 10 A.M. until 3 P.M. Approximately 75% of this use was for recreation: Touring, camping, fishing, picnicking, or boating; 20% was for individuals with summer homes; and 5% for other uses.

For the summer of 1973, it is planned to obtain traffic counter data along with more origin and destination surveys for the Georgetown Lake area.

GEORGETOWN LAKE AREA

ROAD COUNT



TRAFFIC COUNTER LOCATIONS

INDIVIDUAL SEWAGE DISPOSAL SYSTEM INVENTORY

During the summer of 1972, a joint project was undertaken by Granite and Deer Lodge Counties in an attempt to locate and stop direct sources of pollution into Georgetown Lake. Of primary concern are faulty and/or inadequate sewage disposal systems serving homes, summer homes, and commercial establishments near Georgetown Lake. Nearly all the systems were inventoried for adequacy and dye tested to detect leaks or direct water contamination.

Fluorescent dye was introduced into the system after a brief interview with the homeowner or an occupant of each dwelling. Later the dye tested area near the system was observed for appearance of dye. Testing of 238 systems



revealed contamination by three sanitary systems and two additional sink drains. No sanitary sewer pipes were discovered which flowed directly into the lake.

Although this survey showed little direct water pollution from sewage disposal systems, this does not preclude the possibility of nutrients entering the ground water and eventually reaching the lake. Although soil filtration will remove most bacteria from water, soluble nutrient salts can be carried great distances in water until physical or chemical changes cause them to be precipitated or deposited.

All sources of nutrients must be examined, but if waste water treatment were more complete, one important nutrient source could be eliminated and thus help to decrease the rate of eutrophication in Georgetown Lake.

SOLID WASTE SURVEY

In conjunction with the door-to-door sewer system survey conducted on private land during the summer of 1972, information was gathered regarding solid waste problems in the Georgetown Lake drainage.

Historically, several small, open dumps were located around Georgetown Lake. As environmental degradation became more obvious, some of the dumps were relocated to somewhat

more suitable areas and others were closed and covered with earth. The U. S. Forest Service maintained a semi-sanitary landfill operation near Echo lake for about two years for their own use. The dump was closed in 1972. In addition, all Deer Lodge dumps were closed in early 1972 with the opening of the Sanitary Landfill near Anaconda. This resulted in the Anaconda Landfill and the Philipsburg City Dump as the only recognized dumping sites adjacent to the Georgetown Lake area.

Beginning with the 1972 Summer Season the U. S. Forest Service installed bulk solid waste containers in their campgrounds around Georgetown Lake. Emptying and disposal of refuse from these containers was accomplished by contract to a private, licensed hauler. The Anaconda Company maintained refuse cans in their campgrounds by utilizing their own employees and equipment. Also beginning in 1972 was a dilemma faced by seasonal and permanent residents of the area; where and how to conveniently dispose of refuse? Several alternatives were taken: residents in Deer Lodge County were being charged a fee by the nearly county-wide Refuse Disposal District, and consequently, many hauled their refuse to the Anaconda Sanitary Landfill. Some weekend and seasonal residents hauled their refuse back to their permanent residence for disposal. Still others contracted with private disposal companies for regular on-site pickup. All area residents were cooperative in whatever means they chose for refuse disposal although various degrees of inconvenience were involved.

The survey figures were compiled as a result of interviewing 182 seasonal and permanent residents with homes on private land. Three questions were asked of residents: (a) How did you dispose of refuse prior to 1972? (b) How are you disposing of refuse at the present (summer 1972)? (c) How would you desire refuse be disposed of in the future?

Results of survey according to questions a, b, c, above:

(a) past	
Local dumpground	78%
Haul to town themselves	9%
Collection Service	0%
Other-no answer	13%

(b) Present	
Local dumpground	0%
Haul to town themselves	73%
Collection Service	24%
Other-no answer	3%

(c) Desired	
Local dumpground	34%
Haul to town themselves	19%
Collection Service	41%

AREA USE ANALYSIS

The Outdoor Recreation Resources Review Committee reported that most people seeking outdoor recreation, (which included 90% of all Americans) seek it in association with water skiing, walking, swimming, fishing, and boating. Georgetown Lake offers all these experiences. A ten year traffic study completed in 1966 showed that the traffic at Georgetown Lake was increasing at the rate of 18% per year. This is the most comprehensive study available which is applicable to the overall use of the lake.

FISHING ACCESS

The number of people who fish at Georgetown Lake is estimated to be increasing at the rate of 8% per year according to data obtained from the 1970 Fish and Game Management Plan for Georgetown Lake. In 1970 the demand was for 110 fisherman parking spaces, excluding residences. The remaining cars park on the lake shore and undeveloped areas on public and private lands such as Badger and Jerico Bays.

As the fishing pressure has increased, the parking area problem has become more severe and had damaged resources in some areas to a greater degree than others. Additional information from the Fish and Game Department indicates that 91% of the fishermen at Georgetown Lake live within 40 air miles of the lake.

CAMPING

Several camping studies and comparisons have been made since 1950. Although these studies may not have been conducted in a detailed manner, they indicate that campers have increased from 11% to 46% with the latest study being conducted in 1970. The demand for camping sites in 1970 was 363 units. Because there are only 144 units on public land, other campers must use undeveloped areas, (which may damage the resource) or camping areas outside of the drainage basin.

PICNICKING

Annual counts made in 1956 and 1957 indicate that picnicking is increasing at 7% per year. Picnickers use campgrounds and undeveloped areas such as Badger Bay because there are no developed picnic areas in the lake area. The demand for 1970 was 146 units.

BOATING

There are 122 parking spaces for boats on public land. This seems to be close to meeting the demands at present. Boating on the lake varies with the weather and climate of the season but it is estimated that boating use is increasing about 7% per year. While many people bring their own

supply of gasoline and oil, the four Marinas sold 19,136 gallons of gasoline during the 1972 season which was approximately 75% of the previous year's sale. This has been attributed to the cool season that year.

SNOWMOBILING

Early snowfall and easy access makes Georgetown Lake one of the first areas used for snowmobiling each season. Commercial establishments have become snowmobile dealers and schedule snowmobile trips throughout the area. There was no count available but all indications are that the snowmobile use is increasing.

RESIDENTS

There are approximately 300 residents in the area now, and Montana Power records indicate that there has been a 4.3% per year increase in the number of power connections in the Southern Cross area. There are six areas in the drainage where sub-divisions are taking place which could provide about 600 additional building sites.

WATER RIGHTS

Twelve hundred Miner's inches were adjudicated to various individuals and companies during water adjudication hearings on Flint Creek below the Georgetown Lake Dam. The decree stated the Montana Water Electric Power and Mining Co. had a right to store and use water to generate electricity but that 1,200 Miner's inches of water must be released during the irrigation season.

WATER STORAGE

Georgetown Lake is a water storage element in the water supply system developed by the Anaconda Co. to meet the water demands at its smelter and concentrator operations in Anaconda and Butte, Montana. The principle elements in this water system are: Georgetown Lake, Georgetown Lake watershed, Silver Lake, and the transmission facilities from Silver Lake to the industrial operations. The two lakes are located on opposite sides of the ridge dividing two watershed areas. Silver Lake is located on the East side of the ridge and Georgetown Lake on the West. As water is routed into Silver Lake from its watershed, the level of the lake raises and water overflows by gravity from Silver Lake into Georgetown Lake. This generally occurs during July, August and September. A total storage capacity of Georgetown Lake is 35,200 acre feet. At times of low runoff or significant drawdown in Silver Lake, the water stored in Georgetown Lake is pumped into Silver Lake. This generally occurs in January, February and March. The only other significant discharge from Georgetown Lake is to the west where water is used for hydro-electric power generation and irrigation.

RANGE

Lake shore grazing was phased out of the Georgetown allotments by both the Forest Service and the Anaconda Company in 1970. Grazing was eliminated on approximately 1,270 acres, which had supported 380 animal unit months per year. There are still over 1,300 animal unit months grazing in the drainage with the Forest Service administering the majority of the program.

MINERALS

One thousand one hundred thirty five acres of public land around the lake have been withdrawn from mineral entry (except for mineral leasing). The withdrawal area includes all developed and inventoried potential sites that are in public ownership. The Federal Government has retained surface rights on unplatted mining claims. Mining will have a definite effect on the area if the price of minerals makes it economically feasible to mine.

ECOLOGY AND EUTROPHICATION

Ecology is the study of the inter-relationship of living organisms to one another and their surroundings. The lake's environment (ecosystems) includes all organisms and all their interactions. Life in lake ecosystems demands four essential conditions: nutrients, gases, solar energy and water.

In a lake plants are eaten by animals and animals are eaten by each other. This process continues from the lowest plant to the highest animal and constitutes a so-called food web. The food web has two major components—producers and consumers. Animals are the consumers of plants and one another. Green plants are the producers using the sun's energy to create plant tissues. The oxygen produced during photosynthesis is of course vital to animals for respiration. It is also needed by many organisms that produce decay of both plant and animal matter. Each lake is characterized by its own unique situation.

As a lake ages the ecosystems change. This change is referred to as eutrophication. All lakes have a certain prescribed lifetime determined by specific factors. Lakes at various stages in the ageing process may be referred to as youthful (oligotrophic), (mesotrophic), middle-aged, and old-aged (eutrophic). Some recent man-made lakes, such as Georgetown, often exhibit more advanced stages of eutrophication and ageing than much older naturally formed lakes.

There are many factors effecting the rate of ageing and eutrophication including:

1. Depth of the lake—the shallower the lake the more rapid the eutrophication. Georgetown is a shallow lake.
2. Area of watershed—the greater the ratio of the size of the watershed compared to the size of the lake the more rapid the ageing under similar conditions. The ratio for Georgetown is about average.
3. Climate of the area (including temperatures and light regime)—northern latitude, high altitude lakes would age slowly. Georgetown is a northern

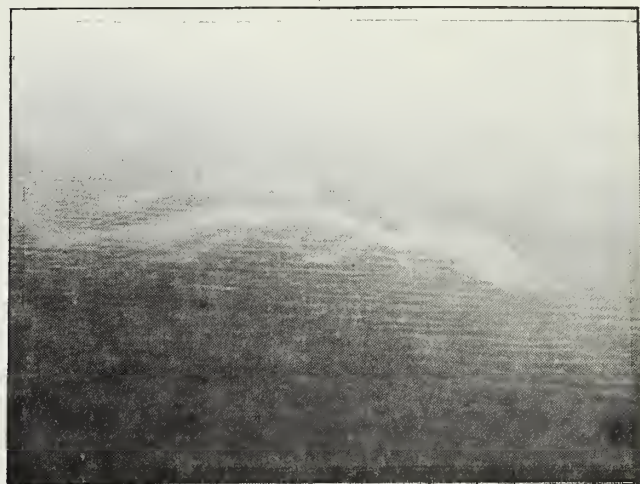
latitude, high altitude lake.

4. Sediment loads of incoming streams—large loads of sediments shorten the lifespan of a lake. Georgetown has a minimal amount of incoming sediments, except from shoreline erosion.

5. Natural fertility of lake basin (including substrate and sediments)—lakes overlaying limestone are likely to age faster than lakes overlaying rhyolite or granite. Lake beds that were fertile valleys before conception, will age much more rapidly than ones that had little or no top soil. Georgetown Lake drainage has an abundant amount of limestone available. The lake basin was a fertile hay meadow before the dam was built.

6. Artificial nutrient input (cultural eutrophication)—concentrations of nutrients from sewage effluents (including human waste, organic chemicals and detergents), agricultural fertilizers and animal wastes will add to the rate of eutrophication. Georgetown does have some artificial nutrient input.

There are some trends associated with lake ageing and eutrophication. First the lake serves as a nutrient trap for the entire basin. The sediments



in the lake also continue to release nutrients, particularly phosphorus. As these nutrients are released they aid biological productivity. As the biological productivity increases the types of plants and animals in the lake change (biotic succession).

Secondly, biotic succession changes from fresh water species to less desirable water species. The phytoplakton (suspended microscopic plants) change from diatoms to bluegreen algae as ageing proceeds. Zooplankton (microscopic animals) change from open water types to shallow mirky water types as eutrophication advances. Bottom dwelling animals change from fingernail clams and snails to bloodworms and sludgeworms. In other words the bottom dwelling animals change from oxygen sensitive forms to oxygen insensitive forms. Finally, the fish change from trout, salmon, and whitefish to suckers, minnows and carp.

Thirdly, as eutrophication proceeds there will be more oxygen depletion in the lower level of the lake until fish winterkills are experienced. The water will become less clean and will start to have odors similar to a swamp.

The events of a single season do not indicate a change in the long term evolution of a lake. Short term events should not be confused with long term changes. A single event or a single season's data does not necessarily signify the presence or the absence of lake problems.

SOIL SURVEY

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SECTION I. THE SOIL SURVEY

How the Soils were Mapped and Named

This involves several paragraphs explained in detail.

General Nature of the Area

Location and Extent—Paragraph describing this.
Climate—Paragraph describing this.
Topography—Paragraph or two describing this.
Geology—Paragraph or two describing this.

Names and Description of Soils

Table I. Identification Legend—Mapping Unit Name

SECTION II. SOIL INTERPRETATIONS

Explanation of Engineering Interpretations and Estimated Properties of Soils

Table II. Will show the engineering and estimated properties of soils and gives ratings for the suitability of each soil for specific uses and the major soil limitations for three uses. The ratings in this table are based on laboratory test data and the judgement of soil scientists who have worked in this area.

GROUNDWATER STUDY

This report is to show the progress of the groundwater study around Georgetown Lake up to the end of 1972. This study has not been completed but the overall plan for completion has been started.

To date 34 groundwater wells have been installed at strategic points around the lake. It is planned that approximately 26 more of these wells will be installed before June 1, 1973. The Soil Conservation Service is using their drilling equipment and the Anaconda Company is furnishing all the well casing and caps to protect the casings.

The wells vary in depth from 10 feet to 20 feet with the majority being 20 feet. Each well is logged for the type and location of material in the well. This information will show levels of aquifers, sands, gravels, clays, etc. which will help determine the feasibility of construction and use in a given area.

Each well will be located by a land survey and the elevation of each will be recorded. In addition, the depth of any water in the well will be recorded at least once a month to determine groundwater flows, both amount and direction. Maps showing this information will be prepared by Ernest Bond of the Bureau of Mines, Montana College of Mineral Science and Technology and Dr. Richard Konizeski, University of Montana.

Water from these wells will be taken and quality tests by the Montana Department of Health will determine its purity. This will help determine if and where any contaminants are entering the lake through groundwater.

Water quality tests along with determining the amounts and directions of groundwater flow, should greatly assist in planning the future of Georgetown Lake as well as the drainage area. It is hoped local people will assist in this study by allowing measurements to be taken from their private wells. Their cooperation will greatly enlarge the study area.

LIMNOLOGY STUDY

The specific objectives of the limnology study will be the (1) development of an understanding of the eutrophication process with emphasis on the role of plant nutrients in aquatic systems, nutrient cycling among water, sediments and biota and nutrient effects on plant growth; (2) development and demonstration of technology to control and reverse the eutrophication processes; and (3) development of methods for monitoring eutrophication conditions and for predicting impact of nutrient sources on the eutrophication of natural waters. With regard to objective (2) many existing or newly developed preventive and remedial processes have been proven successful at the laboratory level will be brought to operating level capable of broad practical application.

Water quality data does not indicate that there is any significant or abnormally high input of nutrients into the lake as a result of human activity. The internal nutrient cycle of the lake seems to hold the key to the eutrophication of Georgetown Lake.

TRAFFIC SURVEY

The Deer Lodge County Planning Board has completed a winter traffic count identifying county of origin and area of Georgetown Lake used.

The study will also indicate the kind of activity engaged in where possible. It was not summarized in time to be included in this report but is available from the planning boards.

CONCLUSION

For several years people have been commenting and complaining about Georgetown Lake. Most of the complaints are centered around the abundant aquatic weed and algae growth within the lake. Complaints are from boaters who don't like weeds around propellers and from fishermen who catch more weeds than fish. To these people, there is a "problem" with Georgetown Lake—too many weeds.

After reading the preceding pages, it may be concluded that Georgetown Lake does not simply have one problem, but numerous situations within the drainage basin which ultimately lead to a high rate of eutrophication and consequent visible weed growth. Weeds are bothersome to fishermen, however they do provide good cover and nutrients for fish food. Generally speaking, people do not like so much weed growth, and they want to increase the longevity of the lake for recreational use by future generations. This means that the rate of eutrophication must be decreased until it is stable. When this point is reached, deterioration of water quality would theoretically be non-existent.

Future research on the lake will determine specific items that will provide us with answers to some of the problems. However, it may point out more problems that have not been identified to date. Factors within the drainage area that are obvious contributors should be controlled as soon as possible.

Preliminary studies that are not conclusive have indicated that there are problems at Georgetown Lake in the following areas:

(a) Direct discharge of sewage systems into the lake does not seem to be a major problem. However, nutrients which add to eutrophication, appear to enter the lake after filtering through the soil. Minimum setback of sewage disposal systems from the lake should be strictly adhered to, or even increased in new or remodeled systems. Older systems which do not comply with current standards could be placed on a compliance schedule to replace them. Future high density housing projects should have carefully designed systems to assure that pollutants and nutrients will not reach the lake.

(b) Preliminary water quality studies indicate that coliform count is higher in some locations of the lake. Some tests have indicated that the surface water has a higher count than water at a lower level. More tests need to be conducted before conclusions can be reached. However, it may be possible that cold water from the creeks and springs is dropping to the bottom of the lake and then being drained from the bottom. Should this be the case, some benefit may be gained by flushing water over the spillway or drawing water from nearer the surface level.

(c) Erosion of the shoreline, roads, trails, camping areas, construction and old mining sites in the drainage, contribute to the deposition of soils and other foreign material into the lake, which adds to the eutrophication. It was observed during the study period that a few scars were beginning to show on the hillsides, in the grasslands from vehicle use.

Shoreline erosion, roads and trails seem to be

the primary contributors to sedimentation of the lake at this time. A good vegetative cover provides the best watershed protection. Measures should be undertaken to stop as much erosion as possible to slow nutrient input into the lake and reduce deposition of material, which slowly fills the lake.

(d) Environment Protection Agency studies have shown that gas and oil passes unburned through outboard engines at the rate of 3-7% at high speeds and 26-30% when operated at low speeds. There is also increasing evidence that exhaust from outboard motors contribute to the taste and odor of fish flesh. These problems are added to by any spillage of gas and oil that occurs.

There have been no studies conducted to date, to determine the effects of this type of pollution at Georgetown Lake.

(e) Littering of the lake and shoreline area can add both nutrients and fill material to the lake basin. Nutrients from discarded organic materials add to the rate of eutrophication. Survey data would indicate that people would like to have a local place to dispose of tree limbs, dead grass, and lumber. Many are hauling their garbage home and others have indicated their desire to cooperate with a disposal service. More information about disposal services and burning regulations would be of assistance to the solid waste problems.

(f) The pH is a measure of acidity or alkalinity with the scale ranging from 0 (acid) to 14 (alkaline), with 7 being considered neutral. In a 1971 test the pH range was from 7.4 to 8.7. In tests, this past summer (1972), the pH range was from 7.5 to 8.9. Possible sources that can cause an increase in the pH level are human wastes, plankton bloom and the limestone characteristics of the area. It should not be concluded that the pH level of the lake has increased on these two tests, as they were conducted using different locations. Studies, however, have not been conducted to determine the cause or causes for the alkaline condition of the lake.

(g) Preliminary studies indicate that the dissolved oxygen content of the lake reaches very low levels during the late winter and spring before the ice cover breaks up. It is necessary to have a sufficient amount of dissolved oxygen in the water for fish to live. Decomposition of organic material (mostly aquatic growth), also makes heavy demands on dissolved oxygen. In the spring of the year before the ice breaks up, there is an annual threat of fish kill. Measures should be taken to increase the dissolved oxygen content of the lake, to improve the fish habitat.

(h) Echo Lake is encountering problems with sedimentation and excessive weed growth. At the present time, the outlet of the lake is located approximately 100 feet from the inlet. This has limited water circulations. The only studies to date around Echo Lake have been soil and vegetative surveys and an engineering design for a new outlet. Echo Lake and Georgetown Lake are connected by stream flow, and additional studies

of Echo Lake should be made to determine its interrelationship with Georgetown Lake.

(i) The nutrient recycling process is a field of study that has not been explored at Georgetown Lake. This is a process whereby the nutrients are tied up in the plants or soil sediments at the bottom of the lake most of the time. As the plants grow they would take up the nutrients and when they mature and die most of the nutrients would return to the soil and be available for future plant growth. This bottom soil could be one of the most important sources of nutrients for the aquatic growth and should be investigated further.

(j) The needs and wants of people using the area need to be considered so that they may be incorporated into a comprehensive plan for the area. A questionnaire was sent to approximately 125 of the homeowners to determine what their needs are and what changes they have observed during the time they have been going to the area. There were about 80 homeowners who returned the questionnaire. The following is a summary of some of the questions:

(1) What would you say has happened to the general quality of the following since you first came to this area?

Quality of the general area:

- 21 improved
- 14 remained the same
- 23 declined slightly
- 7 declined greatly

Water quality of the Lake:

- 4 improved
- 12 remained the same
- 28 declined slightly
- 19 declined greatly

(2) How would you rate the lake water in terms of importance to your activities?

- 36 Essential
- 35 Important
- 4 Not very important
- 0 Of no importance

(3) Factors you consider most important positive attribute?

- 49 Relaxing place to be
- 43 Away from crowds and city
- 40 Good fishing sites
- 36 Nearness to home
- 34 Scenic value
- 29 Boating facilities

The resources of the Georgetown Lake area have been used by many people for a variety of purposes. All natural resources have capabilities and when they are abused or overused the pressure of use shows up in the deterioration of the area. This is beginning to appear in the Georgetown Lake area. Fortunately, concern for the resource has been voiced in time to correct the problems involved and provide an opportunity to extend the life of the lake. A comprehensive management plan should be developed for the area, as soon as possible to preserve the high quality of the environment.

Acknowledgement

The Granite and Deer Lodge Committees for Rural Development wish to express their appreciation to the following:

Local concerned Citizens
Montana Power Co.
Anaconda Company
Granite County government
Deer Lodge government
Montana Fish and Game Department
Montana Water Resources Board
Montana Department of Health
Montana State University
University of Montana
Montana College of Mineral Science
and Technology
Montana Cooperative Extension
Service
Soil Conservation Service
Deer Lodge National Forest, USFS

